

WE CLAIM:

1. An integrated circuit interconnect structure,
5 comprising:

a low K dielectric layer with an upper surface formed
over a semiconductor;

10 a first trench formed in said low K dielectric layer
wherein said trench has sidewalls;

a first contiguous barrier layer formed to a thickness
 X_1 over said upper surface of said low k dielectric layer
15 and formed to a thickness X_2 on said trench sidewalls
wherein X_1 is greater than X_2 ; and

copper formed over said first contiguous barrier.

20 2. The integrated circuit interconnect structure of claim 1
further comprising a second trench comprising sidewalls
formed in said low K dielectric layer and separated from
said first trench by a distance less than 160nm.

3. The integrated circuit interconnect structure of claim 2 wherein said first contiguous barrier layer is formed to a thickness X_2 on said trench sidewalls of said second trench.

5 4. The integrated circuit interconnect structure of claim 1 wherein the ratio X_1 to X_2 is greater than 3 to 2.

5. The integrated circuit interconnect structure of claim 3 wherein the ratio X_1 to X_2 is greater than 3 to 2.

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6. The integrated circuit of claim 1 further comprising a second contiguous barrier layer formed over said first contiguous barrier layer and beneath said copper.

7. A copper integrated circuit interconnect structure,
comprising:

a low K dielectric layer with an upper surface formed
5 over a semiconductor;

a plurality of trenches formed in said low K
dielectric layer wherein said plurality of trenches has
sidewalls;

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a first contiguous barrier layer formed to a thickness
 X_1 over said upper surface of said low k dielectric layer
and formed to a thickness X_2 over said sidewalls of said
plurality of trenches wherein the ratio of X_1 to X_2 is
15 greater than 3 to 2; and

copper formed over said first contiguous barrier.

8. The integrated circuit interconnect structure of claim 7
20 wherein said plurality of trenches are separated from each
other by a distance of less than 160nm.

9. The integrated circuit interconnect structure of claim 7 further comprising a second contiguous barrier layer formed over said first contiguous barrier layer and beneath said copper.

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10. The interconnect structure of claim 7 wherein the dielectric constant of the low K dielectric layer is less than or equal to approximately 3.7.

11. A method for forming a copper interconnect structure,
comprising:

forming a low K dielectric layer with an upper surface
5 over a semiconductor;

forming a plurality of trenches in said low K
dielectric layer wherein said plurality of trenches has
sidewalls;

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forming a first contiguous barrier layer to a
thickness X_1 over said upper surface of said low k
dielectric layer and to a thickness X_2 over said sidewalls
of said plurality of trenches wherein the ratio of X_1 to X_2
15 is greater than 3 to 2; and

forming copper over said first contiguous barrier.

12. The method of claim 11 wherein said plurality of
20 trenches are separated from each other by a distance of
less than 160nm.

13. The method of claim 12 further comprising forming a second contiguous barrier layer over said first contiguous barrier layer and beneath said copper.

5 14. The method of claim 13 wherein the dielectric constant of the low K dielectric layer is less than or equal to approximately 3.7.

15. A method for forming an integrated circuit copper interconnect structure, comprising:

forming a low K dielectric layer with a dielectric
5 constant less than or equal to approximately 3.7 with an upper surface over a semiconductor;

forming a plurality of trenches separated by a distance of less than 160nm in said low K dielectric layer
10 wherein said plurality of trenches has sidewalls;

forming a first contiguous barrier layer to a thickness X_1 over said upper surface of said low k dielectric layer and to a thickness X_2 over said sidewalls
15 of said plurality of trenches wherein the ratio of X_1 to X_2 is greater than 3 to 2; and

forming copper over said first contiguous barrier.

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16. The method of claim 15 further comprising forming a second contiguous barrier layer over said first contiguous barrier layer and beneath said copper.